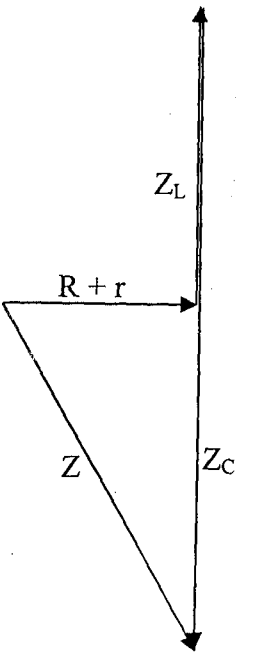
$u = u_C + u_B + u_R \Leftrightarrow L\frac{d}{dt}i(t) + R\,i(t) + r\,i(t) + \frac{q(t)}{C} = u$

$\Leftrightarrow L\frac{d}{dt}i(t) + (R+r)\,i(t) + \frac{1}{C}\int i dt = u$

3) $I_{eff} = 1{,}2$ A.

a) $Z = \frac{U_{eff}}{I_{eff}} = \frac{30}{1{,}2} = 25\Omega \rightarrow 5\,cm$;

$Z_C = \frac{U_{Ceff}}{I_{eff}} = \frac{48}{1{,}2} = 40\Omega \rightarrow 8\,cm$



b) $\omega_0 = \frac{1}{\sqrt{LC}} = 10^3 \text{rad.s}^{-1}$ et $Z_C = \frac{1}{C\omega} = 40\Omega$;

$L\omega \rightarrow 3{,}7$ cm $\Rightarrow L\omega = Z_L = 18{,}5\ \Omega$;

$Z_L.Z_C = L\omega \times \frac{1}{C\omega} = \frac{L}{C} = 40 \times 18{,}5 = 740$

$\begin{cases} \frac{1}{LC} = 10^6 \\ \frac{L}{C} = 740 \end{cases} \Leftrightarrow \begin{cases} \frac{740}{L^2} = 10^6 \\ C = \frac{L}{740} \end{cases} \Leftrightarrow$

$L = \sqrt{\frac{740}{10^6}} = 0{,}0272\ H$

$C = \frac{L}{740} = \frac{0{,}0272}{740} = 3{,}67.10^{-5} F$; $(R + r) \rightarrow 2{,}4$ cm $\Rightarrow R + r = 12\ \Omega \Rightarrow$ $r = 12 - R = 2\ \Omega$.

4)

a) $U_{BC} = Z_{BC} \times I = \sqrt{(2\pi N_1 L - \frac{1}{2\pi N_1 C})^2} \times I = 0$; $I \neq 0 \Rightarrow 2\pi N_1 L - \frac{1}{2\pi N_1 C} = 0$

$\Rightarrow N_1 = \frac{1}{2\pi\sqrt{LC}} = N_0 \Rightarrow$ Le circuit est en résonance d'intensité.

b) $\varphi_u - \varphi_{uc} = \varphi_u - \varphi_i + \varphi_i - \varphi_{uc} = \frac{\pi}{2}$ $(i = C \times \frac{du_C}{dt})$.

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